

Environmental Assessment
Incorporating the Use of a New Temperature Index
into the Calculation of the Pacific Sardine Harvest
Guideline Formula

CPSMT, NMFS, PFMC

September 12, 2014
Spokane, Washington

Background

- Sardine harvest control rules (HCR) include a temperature-dependent parameter
- CalCOFI temperature index recommended; endorsed by SSC and Council
- Hurtado-Ferro and Punt: New simulation model, management scenarios
- March 2014: CPSMT Harvest Parameter Report; Council requested additional scenarios for modeling FRACTION
- April 2014: CalCOFI temperature index used to calculate OFL for 2014-2015 fishing year

Purpose and Need

Purpose – The purpose of this action is to change the temperature index from SIO to CalCOFI for purposes of calculating the FRACTION component of the Pacific Sardine harvest guideline (HG), while maintaining consistency with the Council’s harvest policy approach.

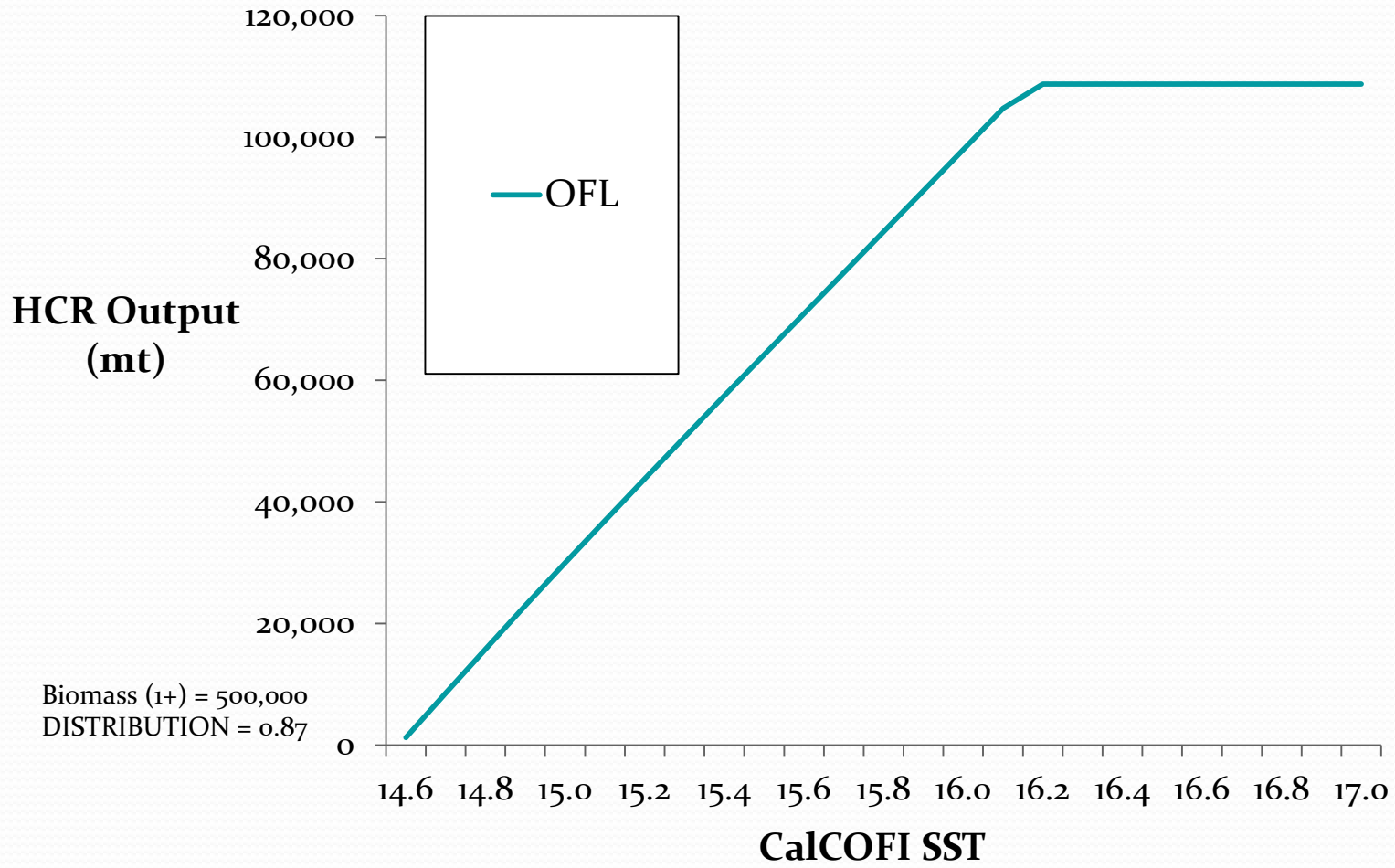
Need – The need for this action is to use the best temperature index in the temperature- productivity relationship in the HG control rule.

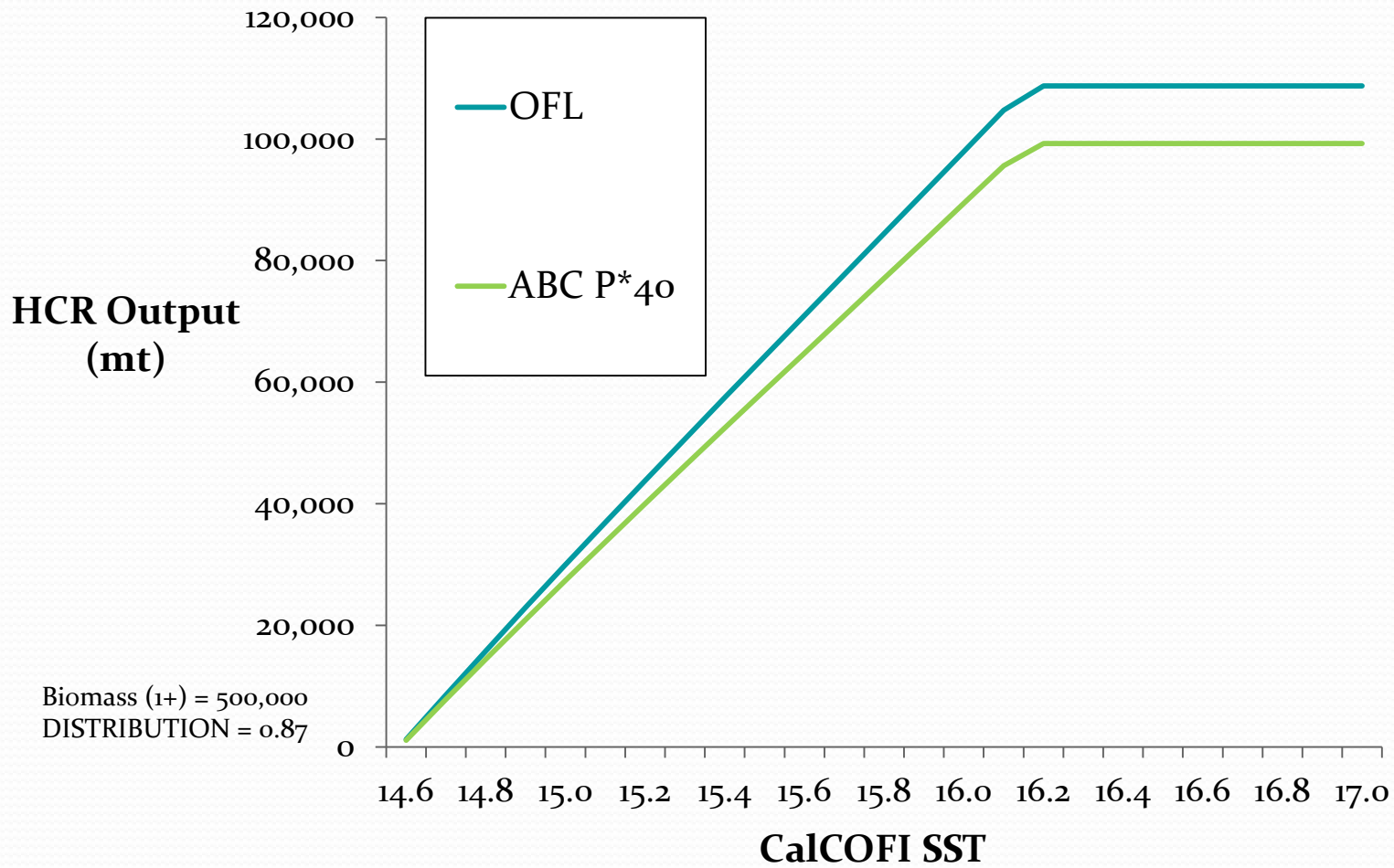
Harvest Control Rule Framework

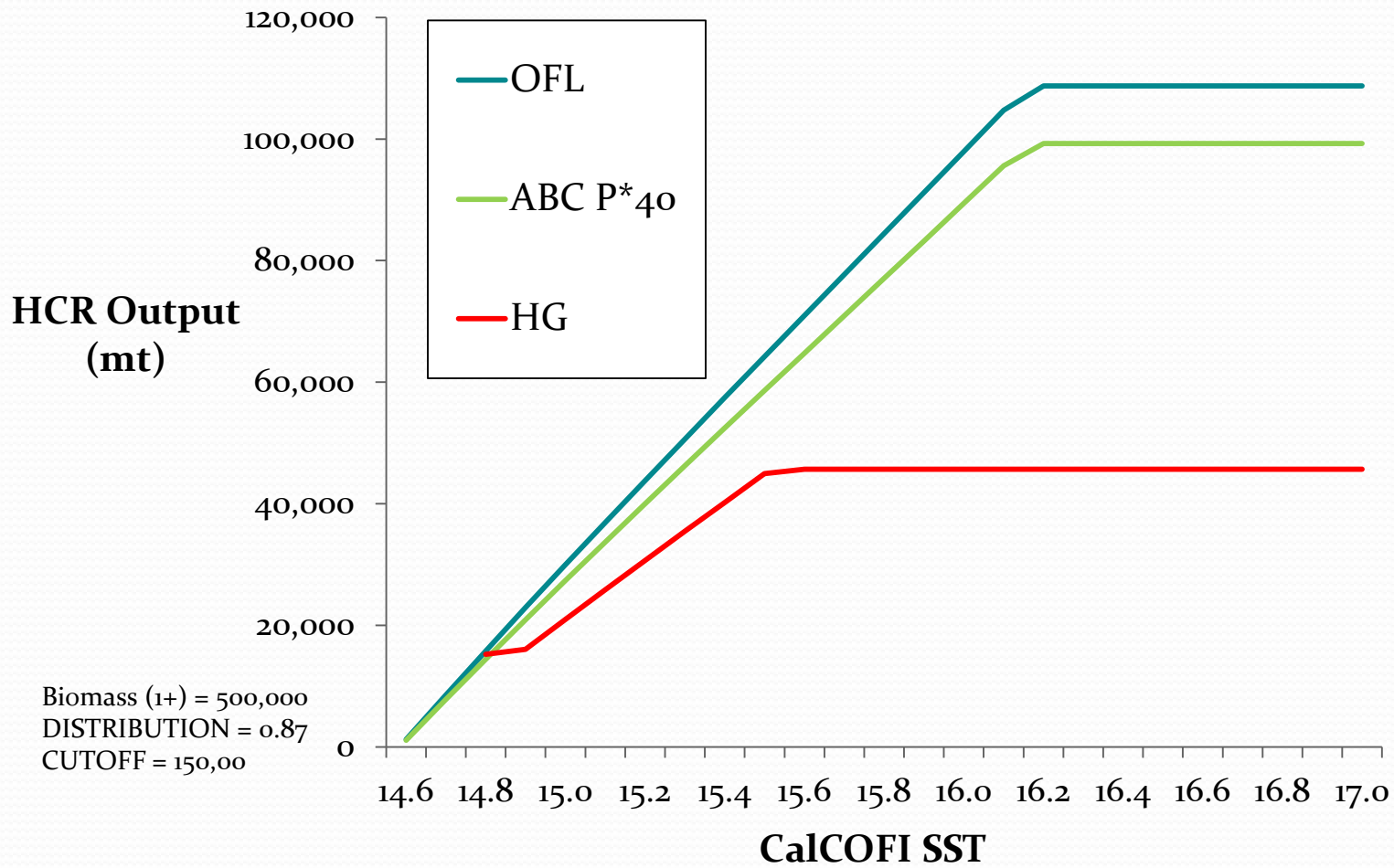
- $OFL = \text{Biomass} * E_{MSY} * \text{DISTRIBUTION}$
- $ABC = \text{Biomass} * E_{MSY} * \text{DISTRIBUTION} * \text{BUFFER}$
- Harvest Guideline
(HG) = (BIOMASS – CUTOFF) * FRACTION * DISTRIBUTION
HG FRACTION bounded at 5 – 15% of E_{MSY}

By policy

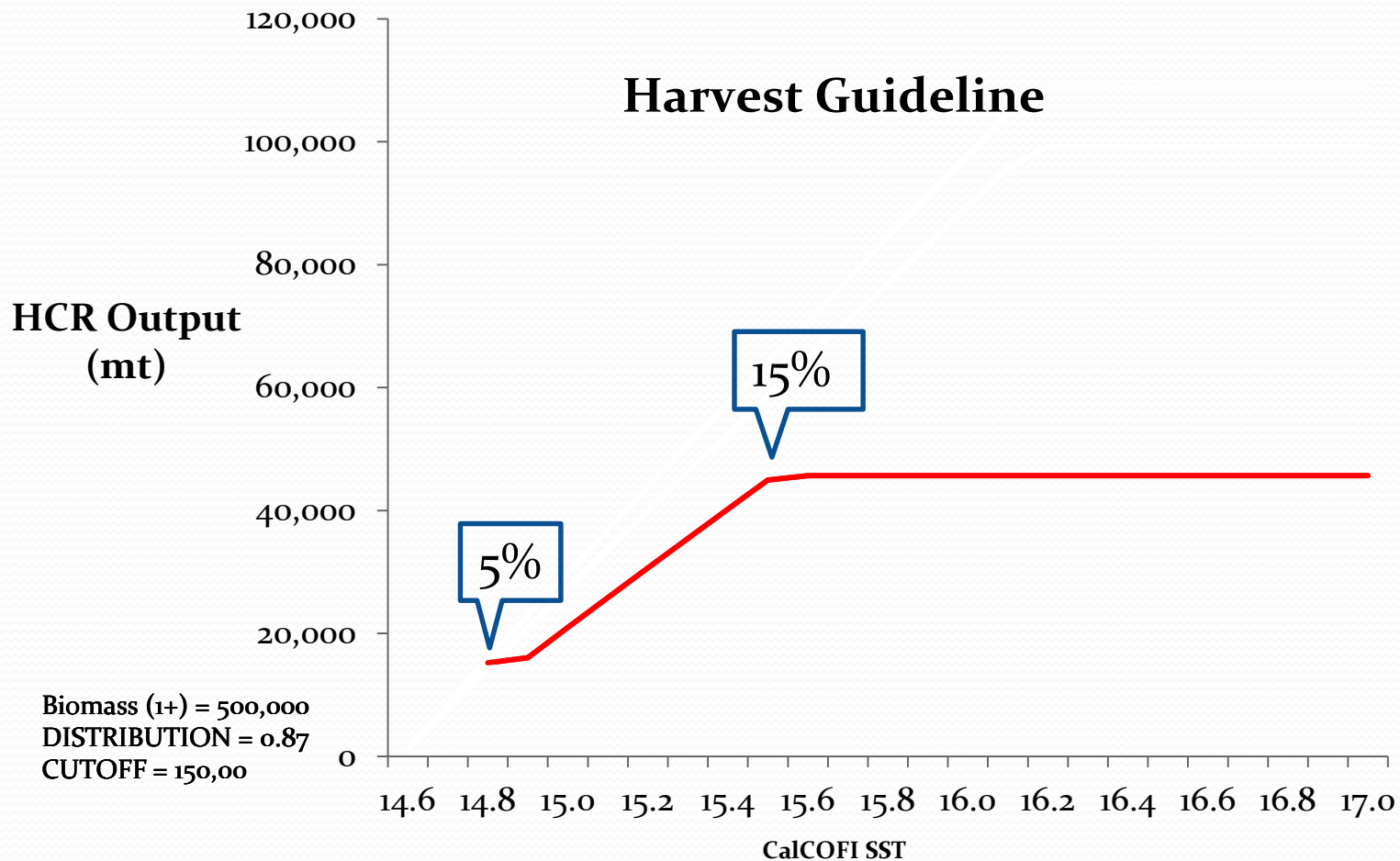
- $ACT = HG \text{ or } ABC, \text{ whichever is lower}$







Harvest Guideline

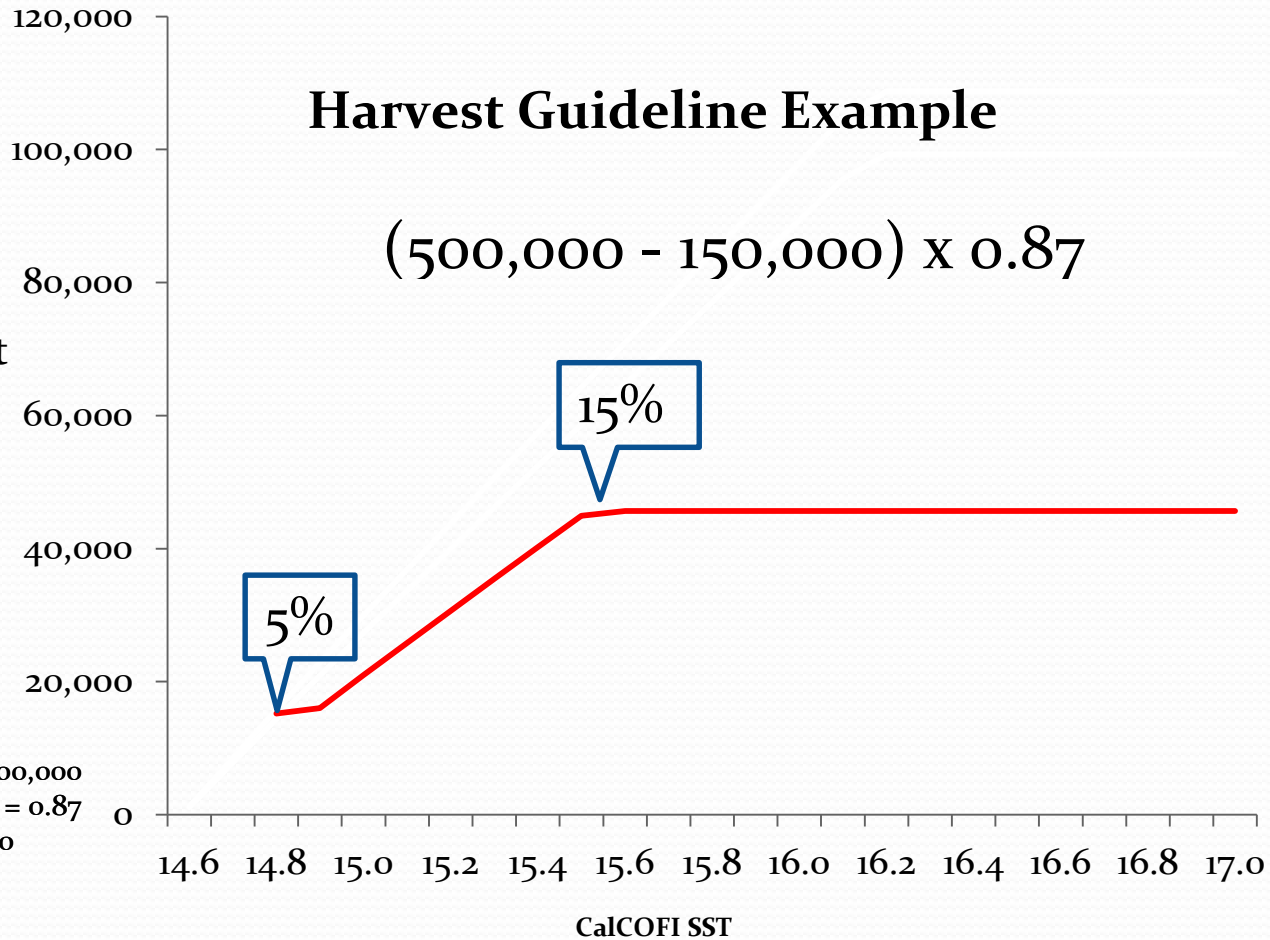


Harvest Guideline Example

$$(500,000 - 150,000) \times 0.87$$

HCR Output
(mt)

Biomass (1+) = 500,000
DISTRIBUTION = 0.87
CUTOFF = 150,000

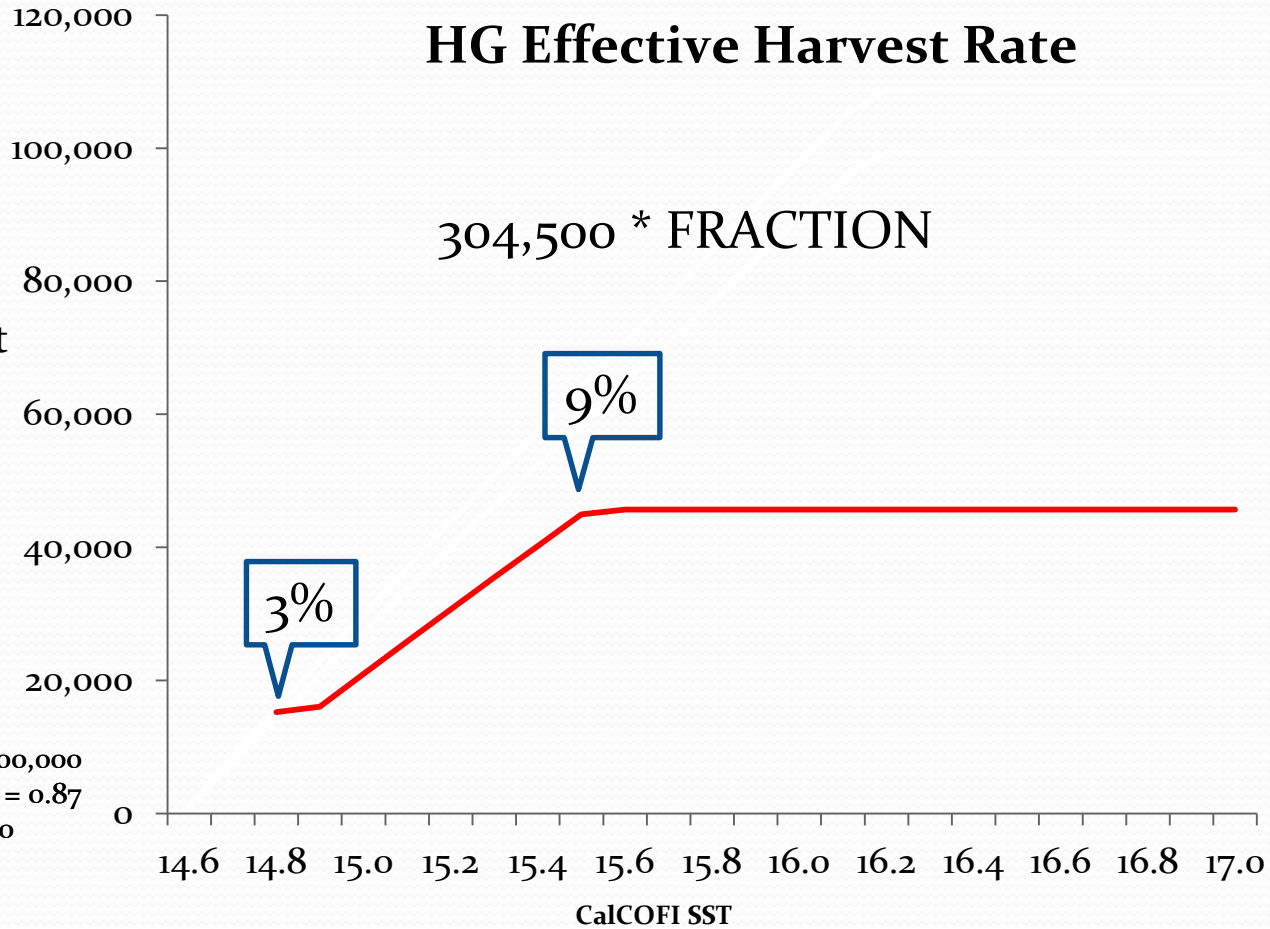


HG Effective Harvest Rate

304,500 * FRACTION

HCR Output
(mt)

Biomass (1+) = 500,000
DISTRIBUTION = 0.87
CUTOFF = 150,00



Environmental Assessment Alternatives

Alternative 1 – SIO Temp Index; HG FRACTION 5-15% (NO ACTION)

Alternative 2 – New Temp Index (CalCOFI); Maintain existing 5-15% FRACTION

Alternative 3 – New Temperature Index (CalCOFI); Revise bounds on FRACTION

3a. FRACTION 10-20%

3b. FRACTION 5-20%

3c. FRACTION 0- 20%

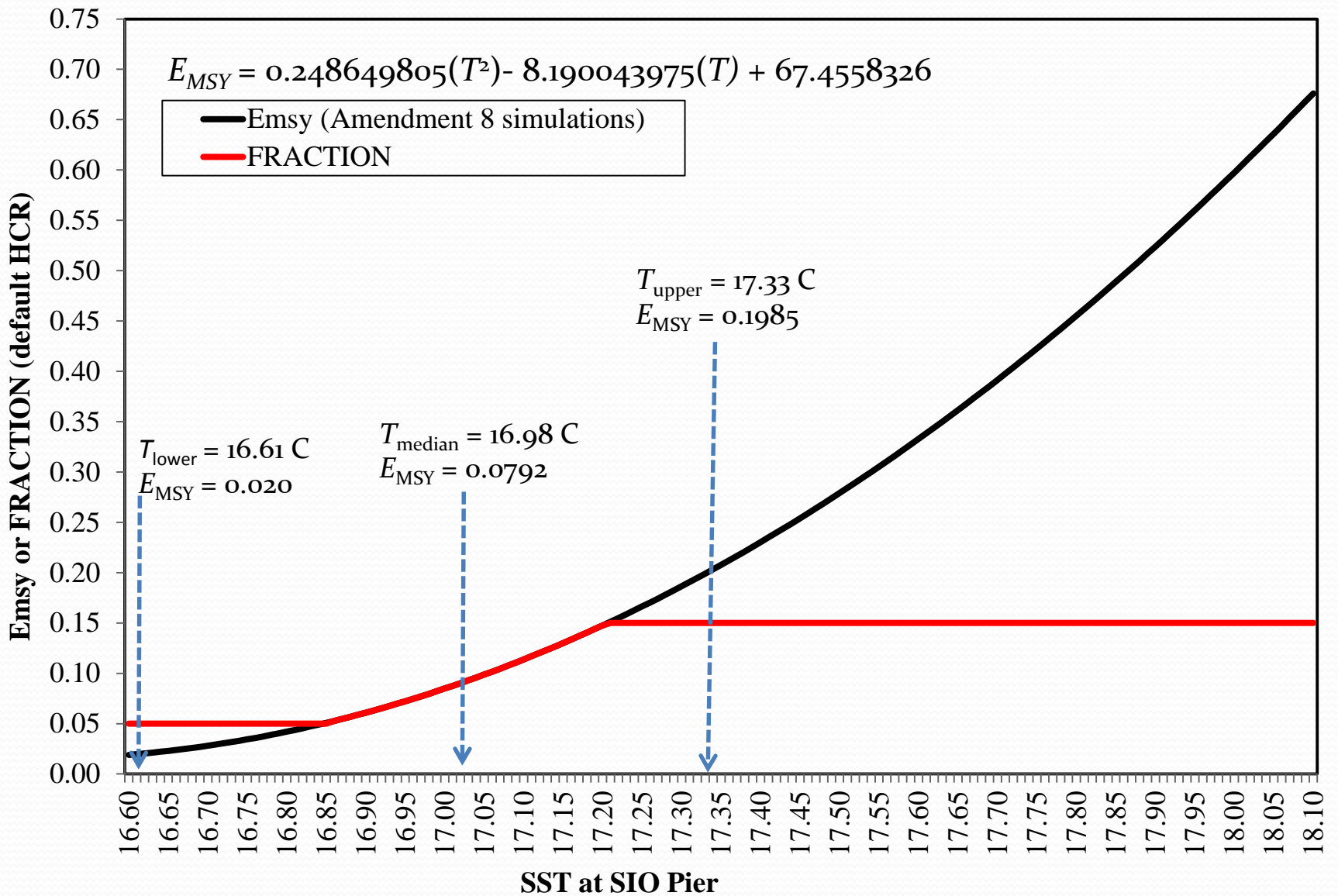
Alternative 1 – SIO Temp Index; HG FRACTION 5-15 (NO ACTION)

Recent analysis:

- Found that SIO SST time series did not provide best fit for sardine temperature-recruitment relationship
- SIO temperatures no longer tracking with Southern California Bight SST

Amendment 8 Analysis:

- Incorporate temperature index
- **Stochastic Emsy of 0.12**
- Control Rule Policy with FRACTION bounded at 5-15
- Depletion - 64⁰%



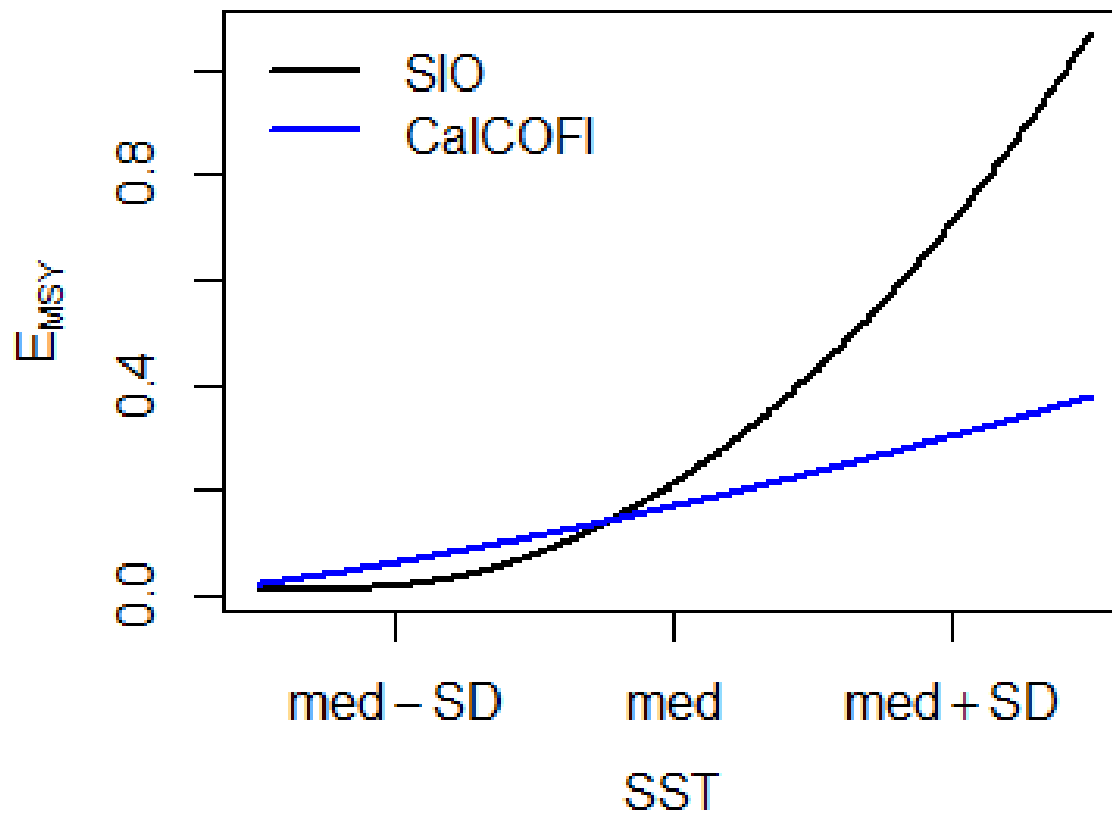


Table 1. Fishery performance measures of action alternatives.

Alternatives	2	3a	3b	3c
HG FRACTION (%)	5-15	10-20	5-20	0-20
OFL E_{MSY} (%)	0-25	0-25	0-25	0-25
CUTOFF	150	150	150	150
MAXCAT	200	200	200	200
Performance Measures				
Biological				
Mean B_{1+} (SD)	1220 (888)	1182 (883)	1186 (882)	1187 (881)
Mean SSB (SD)	945 (757)	911 (753)	915 (752)	916 (751)
% $B_{1+}>400$	92	91	92	92
Depletion (B_{1+} % of Unfished B_{1+})	78	75	75	76
Economic				
%No catch	4.7	4.7	4.8	5.1
%Catch<50	31	31	31	31
Median catch	97	107	107	107
Mean catch all (SD)	106 (73)	112 (75)	111 (75)	111 (76)

Alternative 2 – New Temp Index (CalCOFI); Maintain existing bounds on FRACTION

FRACTION brackets the lower quartile of temperatures vs E_{MSY} .
FRACTION (5-15) falls below CalCOFI stochastic E_{MSY} 0.18

High depletion value of 78% (Table 1)

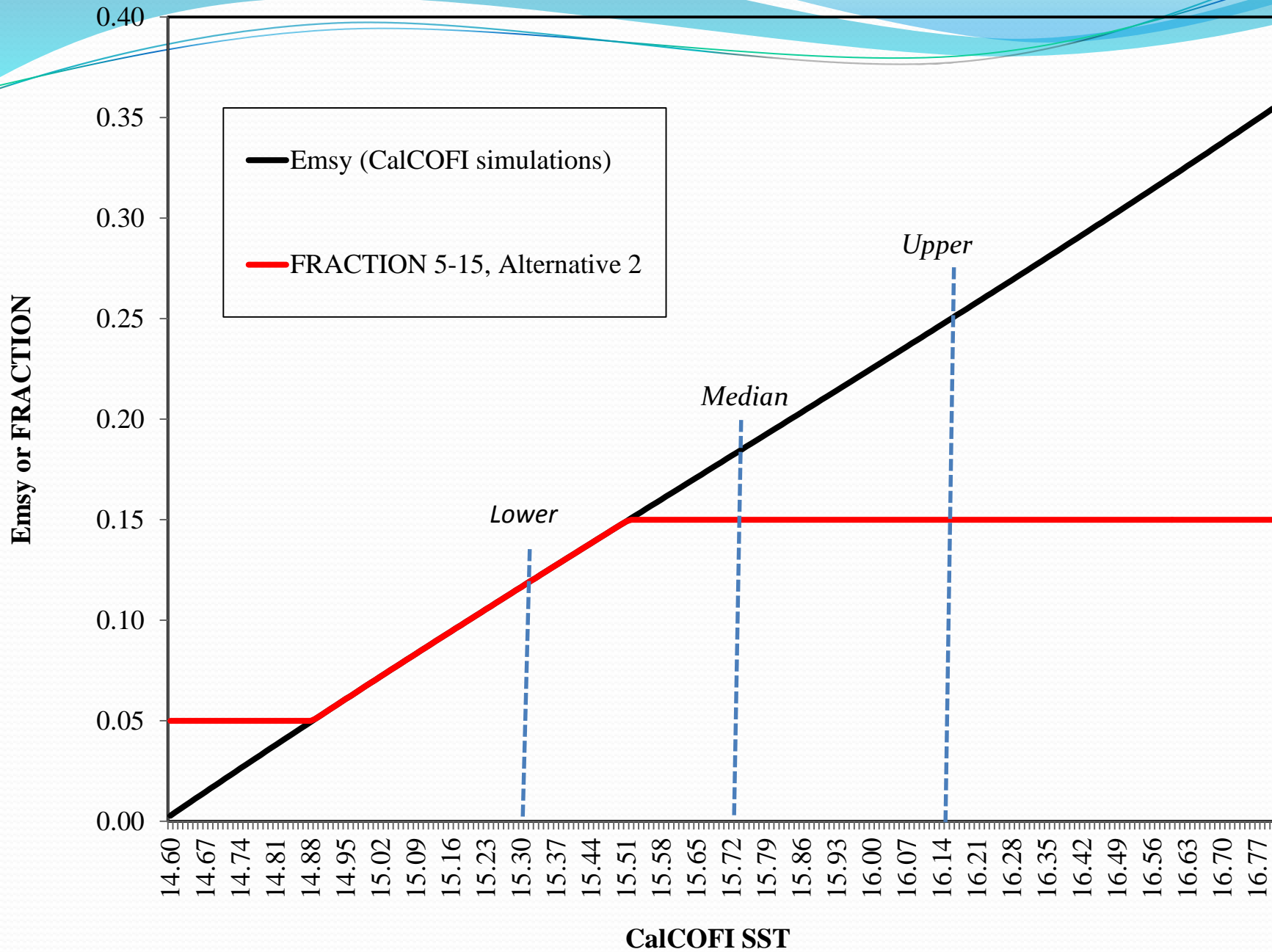
Restrictive harvest policy:

Biomass (1+)

370,000 mt @ 15.3 effective harvest rate = 6%

700,000 mt @ 15.3 effective harvest rate = 8%

700,000 mt @ 16.7 effective harvest rate = 10%



Alternative 3 – New Temperature Index (CalCOFI); Revise bounds on FRACTION

3a. FRACTION 10-20%

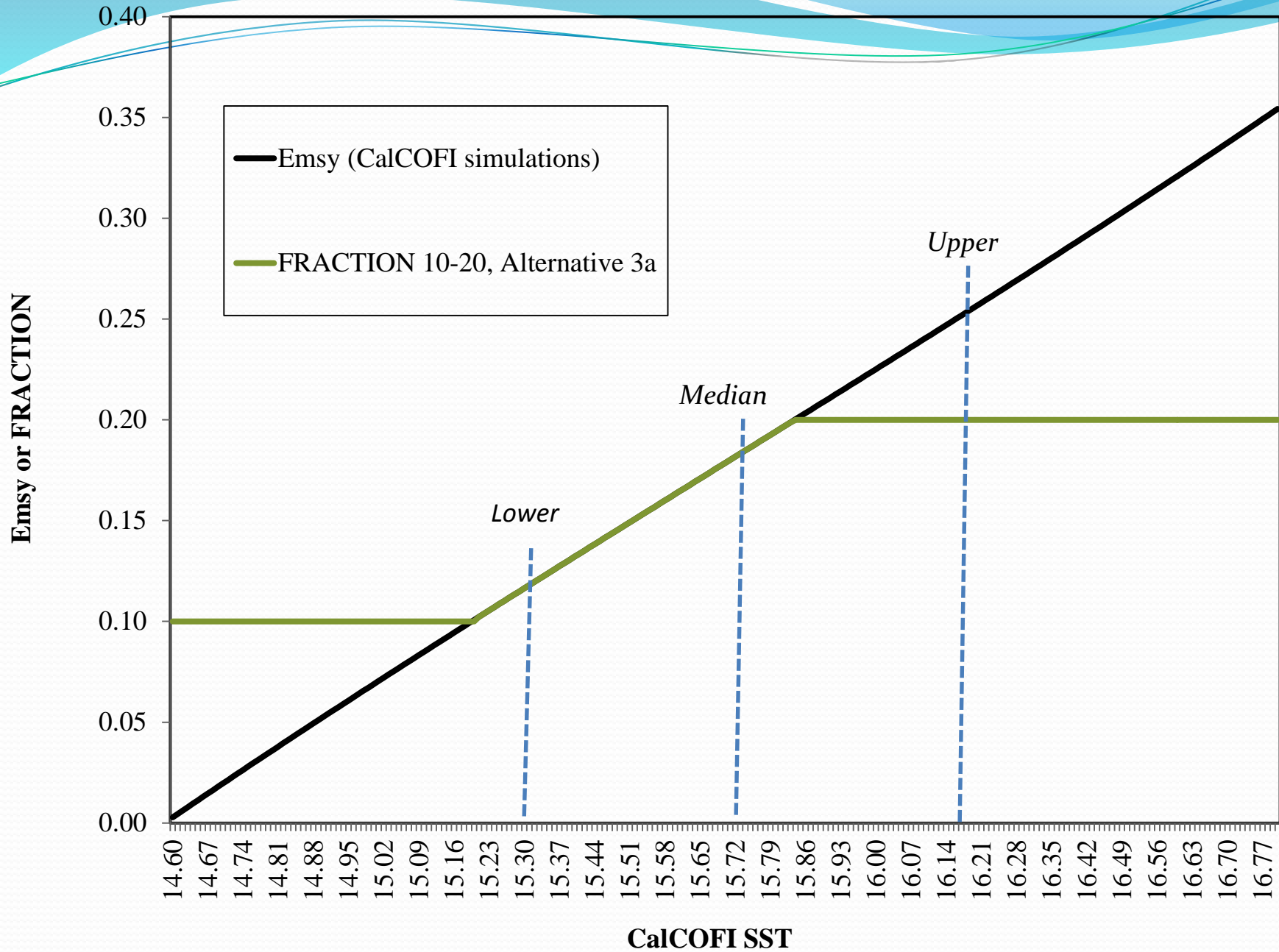
- Mirrors increase from stochastic Emsy of 0.12 in Amend 8 to current 0.18
- Better reflects mid-range of actual measured temperatures

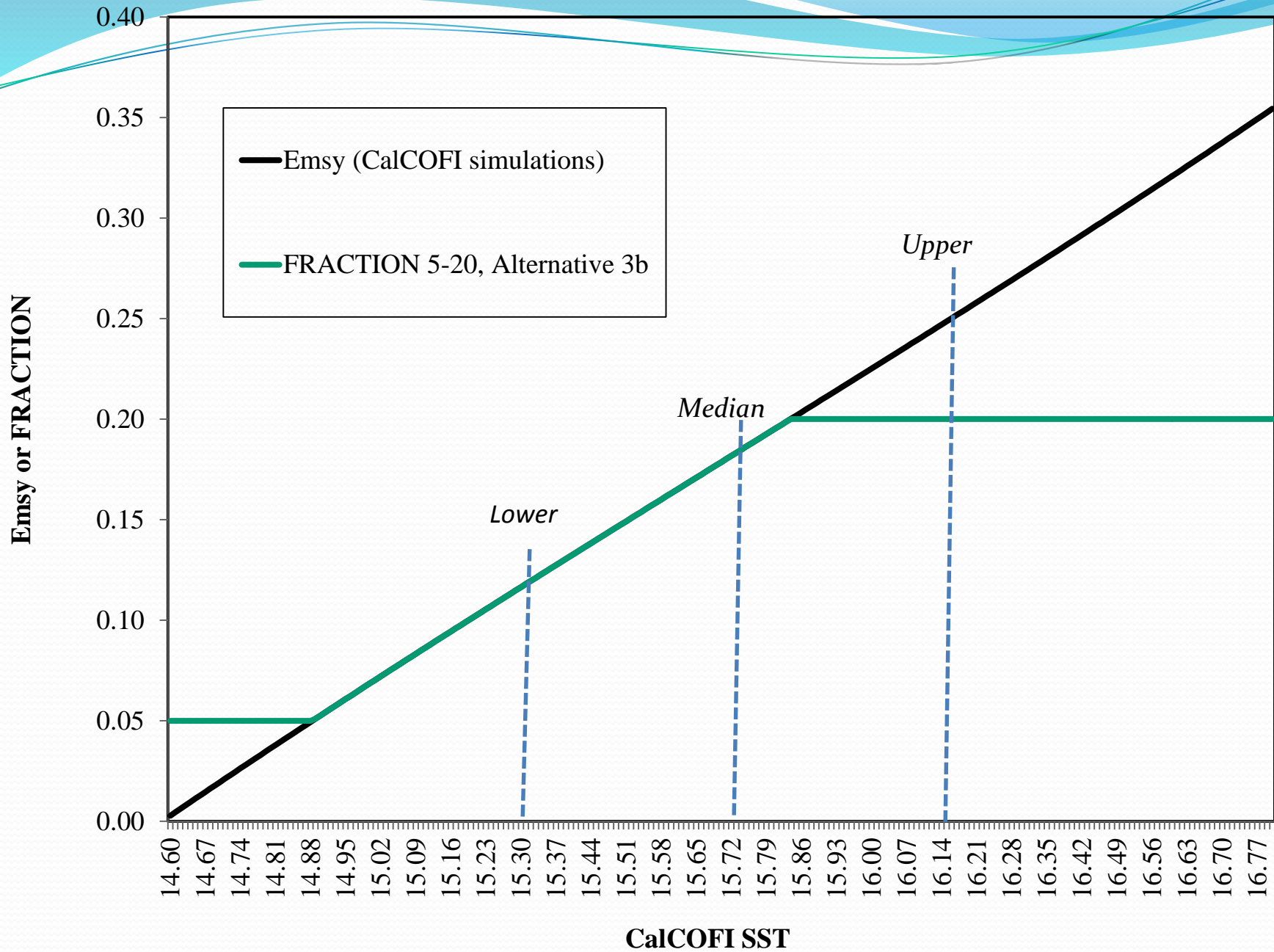
3b. FRACTION 5-20%

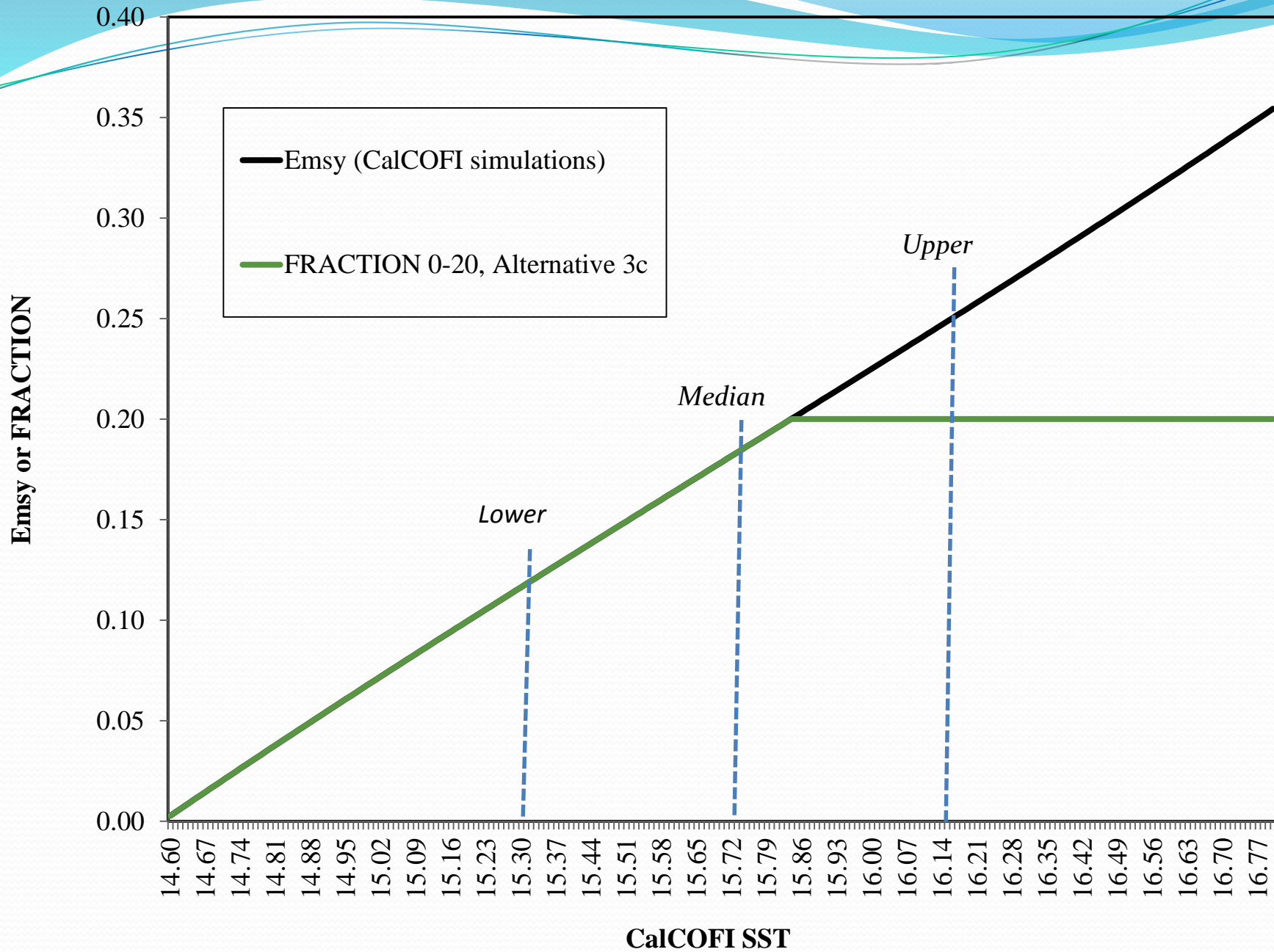
- Blends Alt 2 and Alt 3a
- Accommodates the increase in stochastic Emsy
- More restrictive harvest at lower temperatures

3c. FRACTION 0- 20%

- Captures current stochastic Emsy
- Lower bound restricts harvest more than other alternatives at low temperature and biomass







Interplay between HG and ABC control rules

Biomass	CalCOFI SST	Fraction 5-15	Fraction 10-20	Difference
370,000	14.9	10,078	15,472	5,394
370,000	14.8	9,570	10,657	1,087
370,000	14.7	5,774	5,774	0



Questions?